some most careful observations of his own on the luminous phenomena of the great Polar aurora of the 4th to the 5th of February, 1872; and we had hoped that other important observations by the illustrious Italian astronomer would, to the great advantage of Science, have been published in the future Notes issued from that scientific establishment.

NOTES

We regret to have to record the death of two notable men this week. The one is Sir Henry Holland, Bart., M.D., F.R.S., &c., who died on Tuesday, the 28th inst., at the age of 85 years. Sir Henry had caught cold on returning from Paris, which, in spite of his wonderfully robust constitution, proved too much for the veteran traveller. The other is Mr. Albany Hancock, the distinguished anatomist, who died on the 24th inst. He was a medallist of the Royal Society, though not a Fellow. We hope shortly to give memoirs of both men.

Sir Robert Maclure, C.B., so well known in connection with Arctic discovery, died on the 17th inst., at the age of 66.

Sir Samuel Baker was announced to appear before the Geographical Society on Monday first, and give an account of the geography of the country he has lately visited; but we regret very much to hear that illness will prevent him from fulfilling this and other engagements. He has been suffering from inflammation of the lungs.

Prof. Flower, we regret to hear, has been compelled to spend the winter in Egypt on account of the state of his health.

Dr. J. Emerson Reynolds has been elected Professor of Chemistry to the Royal College of Surgeons in Ireland. The College of Surgeons is to be congratulated on this appointment. Dr. Reynolds will, we believe, still hold his appointment of Keeper of the Minerals and Professor of Analytical Chemistry to the Royal Dublin Society.

Mr. John Stuart Mill has left his herbarium of European plants to Kew.

We are informed that the authorities of the Jardin des Plantes, of Paris, have acquired the valuable collection of books on Natural History belonging to the late M. J. Verreaux, and also his private collection of Sugar birds (*Nectariniidæ*), which includes many unique specimens.

In connection with St. John's College, Cambridge, there will be offered for competition an Exhibition of 50*l.* per annum for proficiency in Natural Science, the Exhibition to be tenable for three years in case the exhibitioner have passed within two years the previous examination as required for candidates for honours: otherwise the exhibition to cease at the end of two years. The candidates for the Natural Science Exhibition will have a special examination (commencing on Friday, December 12, at 9 A.M.) in (1) Chemistry, including practical work in the Laboratory. (2) Physics, viz., Electricity, Heat, Light. (3) Physiology. They will also have the opportunity of being examined in one or more of the following subjects, (4) Geology, (5) Anatomy, (6) Botany, provided they give notice of the subjects in which they wish to be examined four weeks prior to the examination. No candidate will be examined in more than three of these six subjects, whereof one at least must be chosen from the former group. It is the wish of the Master and Seniors that excellence in some single department should be specially regarded by the candidates. They may also, if they think fit, offer themselves for examination in any of the Classical or Mathematical subjects. Candidates must send their names to one of the tutors fourteen days before the commencement of the Examination. The tutors are Rev. S. Parkinson, D.D.; Rev. T. G. Bonney, B.D., and J. E. Sandys, Esq., M.A.

The Royal Horticultural Society of Tuscany has announced an International Horticultural Exhibition to be held at Florence from May 17 to 25, 1874, and has also issued the programme of an International Botanical Congress to be held on three days during the Exhibition. A very large number of prizes, including 100 gold medals, are offered for collections of plants or single plants, which are included in 248 different classes; and among other objects for which prizes may be obtained are bouquets, botanical drawings, models, garden tools and ornaments, garden structures, manures, herbaria, specimens of timbers, &c. The Congress will be opened by the president, Prof. Parlatore; excursions to the neighbourhood of Florence and the principal gardens will be inaugurated, &c.; and among the subjects proposed for discussion, *inter alia*, are the following:—On the duration of dormant vitality in plants, and on the means of restoring it; on the causes of the movements in leaves; on the acclimatisation of perennial plants; on the analogy between the reproductive organs of flowering and (so-called) flowerless plants; on the general occurrence, or otherwise, of cross-fertilisation, and on the durability of the vitality of pollen; on the nature and functions of the gonidia of lichens: on the nature and origin of Bacteria; on the possibility of establishing rules for a rational distinction between the groups called species, race, variety, &c.; on the value to be set on the determination of fossil plants, &c.; on the character and origin of Alpine floras, and especially on the causes which have limited their extension. The Horticultural Society of Tuscany seem determined to do everything they can to attract visitors, who must send their names to the president or secretary at the Musée Royale de Physique et d'Histoire Naturelle at Florence; and altogether botanists and horticulturists seem likely to have a good time of it.

An effectual remedy for the devastations committed on the vines by the *Phylloxera vastatrix* is said to have been discovered by MM. Monestier, Lautand, and D'Ortoman, of Montpellier. It consists in placing in the ground, close to the root of the infected plant, an uncorked tube containing about 2 oz. of bisulphide of carbon. The vapour from the bisulphide in a short time permeates the whole of the ground about the root; the vapour is not, like the liquid itself, injurious to the plant, but is immediately fatal to the insect. Care must be taken not to spill any of the liquid on the roots of the vine.

The following subjects for prizes to be awarded in 1874 hav been proposed by the Batavian Society of Experimental Philosophy:—1. To discover if there exists in the molecular state of bodies, modifications other than those caused by temperature, which are such as to give for the same body, different spectra. The Society wishes that this inquiry should bear chiefly on the magnetic condition of bodies. 2. To find out by new experiments if the vapour of water exercises on radiant heat an absorbant effect much more powerful than dry atmospheric air as Mr. Tyndall maintains; or if there exists no difference in this respect between dry and moist air, as M. Magnus maintains. The Society desires that the new experiments which it asks for be conclusive and enable it to decide between the two opinions. 3. To determine what influence the pressure which is put upon an electrolyte has on electrolysis, and how far in this case is the principle of conservation of energy confirmed. It is wished that this inquiry bear on three liquids at least, to be chosen by the competitor. 4. To determine the resistance of the liquid amalgams of zinc and gold to the galvanic current. Six at least of each of these amalgams, in various proportions, ought to be examined. 5. A prize is proposed for new experiments which will enable a certain decision to be come to on the opinion advanced by M. Gaugain as probable, viz. that voltaic electricity is propagated by matter, while induced electricity is propagated by ether.

The German expedition for the exploration of the Libyan desert is expected to start from Europe about the end of November, and from Egypt early in December, and it is thought that the first reports may accordingly be looked forward to about Christmas. The leader of the expedition is Dr. Gerhard Rohlfs.

Father Secchi, we are glad to see, has received permission from the Italian Government and Cardinal Antonelli to remain at the Royal College of Astronomy.

Among the societies concerning which we have received information since the publication of our list last week, is the Working Men's College Field Club, of which Prof. Flower is president. It meets in the Museum of the College in Great Ormond Street, has been in existence only five months, but appears from a reports before us to be in good working trim. It has meetings at which papers are read, courses of lectures by well-known scientific men, and several field-days each month. These field-days seem generally to be Saturday and Sunday, and we only wish that working-men generally put their Saturdays and Sundays to such an excellent recreative use.

We congratulate the Sunday Lecture Society on the excellent beginning, to be made next Sunday, of their winter course of lectures. Dr. Carpenter, we see, is to give a series of two lectures on the brain; and we think the society ought to consider whether it would not be advisable to have more connected series of lectures than they have hitherto had.

In a final letter to yesterday's *Daily Telegraph*, Mr. George Smith concludes the account of his Assyrian Expedition. Altogether both Mr. Smith and the *Telegraph* are to be congratulated on the results of the enterprise.

The following "Science Lectures for the People," are announced to be delivered at the Memorial Hall, Manchester; the Hulme Town Hall being now required for other purposes:—Wednesday, Oct. 29, "Polarised Light," illustrated by experiments in the electric light, by Wm. Spottiswoode, F.R.S., Treasurer of the Royal Society. Nov. 5, "How Flowers are Fertilised," by A. W. Bennett, M.A., Lecturer on Botany, St. Thomas's Hospital, London. Nov. 12, "On Parasites and their Strange Uses," profusely illustrated, by T. Spencer Cobbold, M.D., F.R.S. Nov. 26, "Animal Mechanics," illustrated by experiments with the electric light and the oxy-hydrogen lantern, by S. M. Bradley, F.R.C.S. Dec. 3. "The Senses," by Prof. Croom Robertson. Dec. 10, "On Muscle and Nerve," illustrated by experiments with the electric light and the oxy-hydrogen lantern, by Prof. Gamgee, F.R.S. Dec, 17, "The Time that has elapsed since the Era of the Cave Men of Devonshire," by Wm. Pengelly, F.R.S.

The French Association, as is known, is to meet at Lille in 1874. Among the many towns which desire to be favoured with its presence in 1875 is Nantes, the Municipal Council of which has already devoted 10,000 francs to defray the preliminary expenses of the session, should it take place there.

According to *La Nature* the volcano of Mauna Loa, in Hawaii, is at present in full eruption.

A Microscopic Society has recently been founded at Melbourne.

Last Thursday the whaler *Erik* arrived in Dundee, having on board R. W. D. Bryan, who was astronomer to the *Polaris* Expedition; B. Manch, seaman; and J. W. Booth, fireman. All the men were in excellent health. On Friday the *Ravenscraig* arrived at Dundee, having on board one of the boats ingeniously constructed by Mr. Chester, in which the castaways effected their escape from their winter quarters. It is about the size of a whaling-boat, and somewhat similarly shaped.

The *Journal of the Society of Arts* gives, from the annual report published by the Minister of Public Education, the following particulars respecting education in Italy during the scholastic year 1872-73:—The number of students registered at the Royal Universities was 5,614, and in addition to this number 1,333 persons were allowed to attend the course of lectures, making in all 6,497. At the Universities of Camerino, Ferrara, Perrugia, Urbino, 284 students and 22 non-students, in all 806, attended the course of lectures. At the Royal Institute of high studies at Florence the number of students was 214. The Literary and Scientific Academy of Milan numbered 26. At the Royal School of Application for Engineers the number of students was 173, and at that at Naples 185. The Technical Institute of Milan was attended by 209 students, and the Normal School of Pisa by 41. 295 students were registered at the schools of Veterinary Science of Milan, Turin, and Naples. The royal lyceums are 79 in number, with 4,228 pupils; the royal gymnasiums 104, with 8,462 pupils. In the royal colleges, which are 26 in number, there were 2,208 pupils. The following schools received subsidies from Government:—32 in Piedmont, 67,290 francs; 19 in Lombardy, 49,810 fr.; 10 in Venetian provinces, 16,550 fr.; 24 in Emilia, 52,800 fr.; 14 in Tuscany, 31,200 fr.; 17 in Marshes, Umbria, and Roman provinces, 20,800 fr.; 54 in Neapolitan provinces, 90,350 fr.; 5 in Sicily, 6,200 fr. The number of elementary schools throughout the kingdom was 41,713 (being 3,413 more than were opened during the previous year). Of this number 21,353 were for boys, and 16,280 for girls. 33,556 were public and 8,157 private schools. The number of pupils attending those schools during the scholastic year 1872-73 was 1,723,007, showing an increase of 145,853 on the number of the previous year; of this 960,517 were boys, and 762,490 girls. The total number of pupils attending the public schools was 1,545,820, and those of the private schools 177,187. The total number of teachers in these schools was 43,420, being an increase of 3,102 on the number of the previous year. Of these 23,212 were teachers in the boys' schools, and 20,211 in the girls' schools; the public schools being conducted by 34,309 teachers, and the private by 9,114.

We have received the Catalogue of the publications of Gauthier-Villars, of Paris, for April, May, and June of this year. It contains the publications of most of the scientific societies of France, beside a number of original works in mathematics, physics, engineering, &c., which recommend it to the attention of scientific men. A few more foreign catalogues have also come to hand, which we would recommend to those who wish to know what is being published on the Continent; no doubt the publishers would be glad to send these catalogues to any one asking for them:—Catalog des Antiquar. Bücherlagers von Fidelis Butsch Sohn (Augsburg, 1874, *sic.*); A catalogue of works in Anatomy and Physiology, and Medicine generally, which belonged to the late Dr. Fahle, of Altona (T. O. Weigel, Leipzig); the same bookseller has sent a Catalogue of standard works in all departments of Science.

We are glad to see that the *Quarterly Journal of Education*, which is shortly to become a monthly, has opened its columns to a correspondence upon questions relating to science-teaching.

We have received a separate reprint from the "Proceedings of the Geologists' Association" of Mr. D. C. Davies' valuable paper on "The Overlapping of the Several Geological Formations of the North Wales Border."

THE United States Signal Service has recently constructed a telegraph line to the summit of Pike's Peak, in Colorado, which is said to be the highest point reached by any line in the United States, or perhaps in the world. The height is said to exceed 11,000 ft. Regular reports as to the weather are to be sent to Washington three times daily.

THE additions to the Zoological Society's Gardens during the past week include an American Cross Fox (*Canis fulvus*), a Golden Eagle (*Aquila Chrysaëtus*), and a Virginian Eagle Owl (*Bubo virginianus*), from North America, presented by Capt. D. Herd; a Mexican Deer (*Cervus mexicanus*), from Porto Rico, presented by Mr. W. Isaacson; two Sand Badgers (*Meles ankuma*), from Japan, presented by Lieut. Hon. A. C. Littleton; a Black-eared Marmoset, (*Hepale penicillata*), from Brazil, presented by Mr. C. Hawkshaw; a Spotted Hyæna (*Hyæna erocuta*), and two Bronze-winged Pigeons (*Phaps chalcoptera*), born in the Gardens; two Rheas (*Rhea americana*), from S. America, deposited; two Chilian Tinamous (*Rhynchotus perdicarius*), three Banded Tinamous (*Crypturus noctivagus*), and two Obsolete Tinamous (*C. obsoletus*), from S. America, received in exchange.

ORIGINAL RESEARCH AS A MEANS OF EDUCATION *

II.

IT is the greatest possible mistake to suppose—as, unfortunately, many yet do—that a scientific education unfits a man for the pursuits of ordinary professional or commercial life. I believe that no one can be unfitted for business life or occupations by the study of phenomena, all of which are based upon law, the knowledge of which can only be obtained by the exercise of exact habits of thought, and patient and laborious effort. I dare say many who have had a scientific education make bad men of business, but so do many who have not had such an education; it is not the scientific education which has spoilt them. Even more directly does the value of scientific education bear upon professional and manufacturing life. The medical man's success depends mainly upon the exercise of faculties which are pre-eminently called forth, and strengthened in original scientific investigations. The manufacturer who aspires to something more than following the rule-of-thumb work of his predecessors, requires exactly these habits of mind which are developed by original research. If the brewer, the calico-printer, the dyer, the alkali-maker, the metallurgist wish to make any advance of their own in their respective trades, they cannot do so without the exercise of powers which can only be gained by the prosecution of original inquiry. Doubtless many—nay, even most—of the great discoveries and improvements in the arts and manufactures may have been made by men who have been self-taught. But these men have acquired for themselves, by slow and difficult steps, the same habits of exact observation, patient and laborious devotion, and manipulative or constructive skill which the modern student of science may, at any rate to a very considerable extent, gain in his college course. So valuable is this kind of education found to be, that in Germany, where it is most practised, the chemical manufacturers now refuse to take young men into their works unless they have not merely had a scientific education, but also have prosecuted original investigation.

If, then, education in its widest sense has for its objects, as I presume will be generally allowed, the training of the mind and faculties in such a way as most fully to qualify the possessor to discharge with benefit to mankind his duties in after-life, surely plans for the encouragement of original scientific research should form no inconsiderable portion of the work of every institution professing to deal with the higher education of the country. And yet when we come to look at the provision made for encouraging original research, either at our older or at most of the more modern seats of learning, we are astonished to find that this essential provision is almost altogether ignored. At Oxford and Cambridge thousands of pounds are each year lavished upon the encouragement of classical and mathematical attainments, whilst the claims of original research can scarcely be said to be recognised. Hence these highly endowed universities, whilst they are justly celebrated for their critical faculties, have ceased to represent, in any one direction, the productive power of the country.

Original research, the true life-breath of civilisation, does not in England, as is the case in Germany, look to the universities as the nurseries where its young shoots shall be tended and cherished, for there, at present, its value is scarcely recognised. Indeed, Sir William Thompson has expressed his opinion that the system of examinations at the universities has a tendency to repress original inquiry, and exerts a very injurious effect in obstructing the progress of science. The time is, however, not far distant when this want of appreciation of the value of original research will be a thing of the past, and when the universities will vie with each other in encouraging this mainspring of progress, and in honouring more those whose lives are devoted to this high calling. Owing to the want of means of promoting original investigation in our great seats of learning, the scientific activity of the country has found vent through other channels. No want of encouragement can repress really great minds or powerful wills. Manchester can boast the names of many men who, in spite of want of university aid, have done much for science. Who, for instance, in the whole scientific annals of Oxford, can be placed on a footing of equality with Dalton or Joule? These men are, however, great in spite of our systematic negligence of the subjects, the mastery over which has made their names immortal.

If, in the face of so much that is discouraging in this want of recognition of science, England has still no reason to fear the comparison of her great men of science with those of other countries, we may feel sure that our position among the nations will be raised when the Government, our universities, and the country at large become alive to their duties as regards the encouragement of original scientific research, and when the number of able men who devote themselves to this pursuit shall thereby be largely increased. Much assistance in this direction may confidently be expected from the Royal Commission on Scientific Instruction and the Advancement of Science, of which his Grace our President is chairman, and which has lately published its third report on the progress of scientific education and research in the two old universities. In this report, the importance, from a national point of view, as well as an educational instrument of original research is fully recognised, whilst the means of enabling the universities to take their due share in the management of this branch of human activity is suggested. The evidence given before this Commission by Sir Benjamin Brodie, Prof. Frankland, Dr. Carpenter, and other competent authorities, is of the most decided and unanimous character, and the opinion thus strongly expressed must ere long produce its effect.

The importance of fostering scientific research in connection with higher education is, however, now well understood to the authorities of this college. Very considerable facilities for carrying out original work are given both to the teachers and to the pupils, whilst in the appointment of the professors special weight is always laid on their power of conducting scientific research. In my department, which has now been organised for many years, I make bold to say that we have not been behind any chemical laboratory in this kingdom in the original work we have produced. The physical laboratory, which has only recently been inaugurated, has already, under the care of its talented Director, whose original researches are valued wherever Science is appreciated, done valuable work, and the new department of practical physiology which has just been established will doubtless soon bear fruit of a similar character. In the biological sciences our teaching resources have hitherto been limited; but although this has necessarily prevented the prosecution of research by the students, the professors of this department have long been distinguished for original investigation in their special branches.

To assist in developing in the practical community the appreciation of scientific research, and owing to the liberality of Manchester men and to the wise advice of Prof. Frankland, who then occupied the chair which I have now the honour to hold, a scholarship for original chemical research—our Dalton Chemical Scholarship—was founded in 1853 as a testimonial, and a fitter one could not have been proposed, to our great townsman. The establishment in England of a scholarship for excellence in original research was, twenty years ago, a circumstance without a parallel, but in spite of the novelty of the experiment, time has fully proved the wisdom of the course which its originators adopted. We can already point to a fairly long list of men who have taken our Dalton Scholarship, who now hold high and

---

Concluded from p. 539.